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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/611,916	07/07/2000	Tsuyoshi Toki	P24,207 USA	7761

7590 12/06/2004  
Gary A Hecht  
Synnestvedt & Lechner LLP  
1101 Market St Suite 2600  
Philadelphia, PA 19107-2950

EXAMINER
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FLORES RUIZ, DELMA R

ART UNIT	PAPER NUMBER
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2828

DATE MAILED: 12/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/611,916

Applicant(s)

TOKI, TSUYOSHI

Examiner

Delma R. Flores Ruiz

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 October 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 14-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07/07/2000 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/17/05
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election of claims 1 –11and 14-22 are without traverse in the reply filed on 10/220/2004 is acknowledged.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 – 5, 11, 14 – 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurosawa et al (5,914,773) in view of Suzuki (5,627,627)

***Regarding claim 1***, Kurosawa discloses a laser apparatus, comprising: a laser element (see Fig. 3 Character 1) that emits a laser beam; a detector (see Fig. 3, Characters 14 and 15) that detects the laser beam emitted from the laser beam body; and a controller (see Fig. 3 Character 103) that controls the laser element to emit the

laser beam under a plurality of emission conditions in a ready state, (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

Kurosawa discloses the claimed invention except for controls the detector to detect the laser beam emitted in the ready state. It would have been obvious at the time of applicant's invention, to combine Suzuki of teaching a control the detector to detect the laser beam emitted in the ready state with laser because a laser beam reflected by the beam splitter is focused on the light-receiving surface of a light-receiving element (photoelectric detector) by a condensing optical system. The light-receiving element precisely outputs a photoelectric signal according to the light quantity (light intensity) of each light pulse of the laser beam, and comprises a PIN photodiode having a sufficient sensitivity in an ultraviolet region, and the like. A photoelectric signal output from the light-receiving element is supplied to the main control system, and the main control system includes a calculator, which sequentially integrates the light quantities of light pulses. The measured value (integrated light quantity) serves as fundamental data upon control of the applied voltage in units of light pulses for the pulse laser source and upon execution of oscillation, control in units of light pulses of the pulse laser source via the trigger controller in the main control system. Note that the relationship between the illuminance of the laser beam on the exposure surface of the

wafer W and the photoelectric signal output from the light-receiving elements obtained by, e.g., a power meter in advance, and is stored in a memory (Column 8, Lines 8 – 45).

**Regarding claim 2**, Kurosawa discloses the emission conditions include an energy of the laser beam and an emission period of the laser beam, and the emission conditions in the ready state are changed by changing at least one of the energy and the emission frequency (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 3**, Kurosawa discloses the controller determines control data for controlling an output of the laser beam for each of the emission conditions based on detection results of the detector in the ready state (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 4**, Kurosawa discloses laser emits pulses of the laser beam, and the controller determines the control data to control the output of the laser beam for a predetermined number of pulses from when emission is initiated (Column 1, Lines 28

– 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

***Regarding claim 5,*** Kurosawa discloses the laser beam is emitted by applying a predetermined voltage to the laser element and the controller adjusts the voltage supplied to the laser element during a usage state, in which the laser beam is emitted outside, based on the control data (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

***Regarding claim 11,*** Kurosawa discloses a method of controlling a laser apparatus that emits a laser beam, comprising the steps of: emitting a laser beam under a plurality of emission conditions during a ready state in which the laser beam is not directed outside of the laser apparatus; and detecting the emitted laser beam in the ready state (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 14**, Kurosawa discloses a laser apparatus that emits a laser beam to an external device, comprising: a laser element (see Fig. 3, Character 1) that emits the laser beam; and a laser controller (see Fig. 3, Character 103) that receives information from the external device and controls (see Fig. 3, Character 103 and 104) the emission of the laser beam from the laser element, wherein the controller determines an emission condition of the laser beam during a ready state, in which the external device does not use the laser beam, based on the information (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 15**, Kurosawa discloses the information includes an emission condition of the laser beam used in an operation which is performed by the external device after ready state (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 16**, Kurosawa discloses the information includes an emission condition of the laser beam from the laser element in the ready state (Column 1, Lines

28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 17**, Kurosawa discloses the information includes a target energy of the laser beam emitted from the laser element (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 18**, Kurosawa discloses the laser element emits pulses of the laser beam with an emission frequency, and the information includes the emission frequency of the laser beam (Column 1, Lines 28 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 60, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67 and Column 9, Lines 1 – 16, 55 – 67).

**Regarding claim 19**, Kurosawa discloses the external device includes an exposure device that exposes a substrate by irradiating a mask with the laser beam



emitted from the laser element and projecting a pattern image of the mask on the substrate (Column 1, Lines 15 – 27, Column 3, Lines 47 – 62, Column 10, Lines 56 – 67, Column 11, Lines 8 – 25).

**Regarding claim 20**, Kurosawa discloses the laser element emits pulses of the laser beam with an emission frequency and the information includes at least one of a target energy of the laser beam and the emission frequency of the laser beam (Column 1, Lines 15 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 62, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67, Column 9, Lines 1 – 16, 55 – 67, and Column 10, Lines 56 – 67, Column 11, Lines 8 – 25).

**Regarding claim 21**, Kurosawa discloses the information includes an emission condition of the laser beam used in an operational, which is performed by the exposure device after the ready state (Column 1, Lines 15 – 67, Column 2, Lines 4 – 13, 24 – 49, Column 3, Lines 47 – 62, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67, Column 9, Lines 1 – 16, 55 – 67, and Column 10, Lines 56 – 67, Column 11, Lines 8 – 25)

**Regarding claim 22**, Kurosawa discloses the operation of the exposure device includes the exposure of the substrate (Column 1, Lines 15 – 67, Column 2, Lines 4 –

13, 24 – 49, Column 3, Lines 47 – 62, Column 4, Lines 16 – 67, Column 5, Lines 1 – 2, 25 – 39, Column 6, Lines 24 – 32, 35 – 44, Column 8, Lines 55 – 67, Column 9, Lines 1 – 16, 55 – 67, and Column 10, Lines 56 – 67, Column 11, Lines 8 – 25).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurosawa et al (5,914,773) in view of Sandstrom et al (6,621,846).

***Regarding claims 6 – 10***, Kurosawa discloses the claimed invention except for a circulating device that circulates gas in the laser element, wherein the controller controls the circulating device during a usage state, in which the laser beam is emitted outside, based on the control data generated in the ready state, wherein the circulating device includes a fan for circulating the gas in the laser element, and the controller adjust the

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rotating speed of the fan to adjust the circulation of the gas in the laser element, wherein the emission conditions include a circulating speed of the gas in the laser element and the emission conditions are changed by changing the circulating speed, and the controller adjusts the pressure of gas in the laser element, the emission conditions include a pressure of the gas in the laser element, and the emission conditions are changed by changing the pressure. It would have been obvious at the time of applicant's invention, to combine Sandstrom of teaching a circulating device that circulates gas in the laser element, wherein the controller controls the circulating device during a usage state, in which the laser beam is emitted outside, based on the control data generated in the ready state, wherein the circulating device includes a fan for circulating the gas in the laser element, and the controller adjust the rotating speed of the fan to adjust the circulation of the gas in the laser element, wherein the emission conditions include a circulating speed of the gas in the laser element and the emission conditions are changed by changing the circulating speed, and the controller adjusts the pressure of gas in the laser element, the emission conditions include a pressure of the gas in the laser element, and the emission conditions are changed by changing the pressure with laser because in the chamber laser gas is circulated by fan and cooled by heat exchanger and a fan for circulating said laser gas within said chamber and through said discharge region. Provides equipment and methods for correcting wavelength chirp in high pulse rate gas discharge lasers. Identified the major cause of

prior art wavelength chirp as pressure waves from a discharge reflecting back to the discharge region coincident with a subsequent discharge. The timing of the arrival of the pressure wave is determined by the temperature of the laser gas through which the wave is traveling. During burst mode operation, the laser gas temperature in prior art lasers changes by several degrees over periods of a few milliseconds. These changing temperatures change the location of the coincident pressure waves from pulse to pulse within the discharge region causing a variation in the pressure of the laser gas which in turn affects the index of refraction of the discharge region causing the laser beam exiting the rear of the laser to slightly change direction. This change in beam direction causes the grating in the LNP to reflect back to the discharge region light at a slightly different wavelength causing the wavelength chirp. The time of return of pressure wave echoes can be very important since Tests have shown the pressure wave has a thickness (of the pressure front) of about 4 mm or about the thickness of the approximately 4 mm discharge region. The difference between the low pressure part of the wave and the high pressure part is about 0.03 to 0.07 atm or about 1 to 2% of the chamber pressure. If a pressure wave echoes back through the discharge region at any time other than during the approximately 40 ns time period of a subsequent pulse, it causes no problem. The problem is caused when a returning pressure wave in a high pulse rate laser from a particular discharge passes through the discharge region at the exact time of the subsequent pulse. If the echo pulse is exactly centered over the discharge region, the low-pressure portion would be on one side of the region and the

high pressure portion would be on the other. The result is a gas pressure such as 3.015 atm on one side of the discharge region and 2.985 atm on the other side (Fig 1, Column 1, Lines 13 –20. Column 8, Lines 23 – 40 and Claim 1).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Delma R. Flores Ruiz whose telephone number is (571) 272-1940. The examiner can normally be reached on M - F.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Min Sun Harvey can be reached on (571) -272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>.

Should you have questions on access to the Private PAIR system, contact the  
Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Delma R. Flores Ruiz  
Examiner  
Art Unit 2828



Min Sun Harvey  
Supervisor Patent Examiner  
Art Unit 2828

DRFR/MH  
November 24, 2004